**Appendix A. Supplementary material**

This appendix of supplementary information provides detailed descriptions of the other 15 sites that do not provide strong constraints on the position of sea level. All sample ages and site locations are shown in Table 1 and Figure 2 of the main text.

*Site 1, southwest of Arviat I*

Excavation of a 35 cm deep hole approximately 90 km southwest of Arviatat an elevation of 158.8 m exposed layers of brown well humified peat to19 cm depth, underlain by 16 cm of grey-brown, coarse, wellsorted sand. A basal peat sample from 17 to 19 cm was obtained (sample 10-50a), aswell as an overlying sample from 15 to 16 cm depth (10-50b). *Carex* (sedge) achenes wereextracted from both samples, and 10-50a and 10-50b yielded ages of 2855 ± 2014C yr BP (2884–3063 cal yr BP) and 1890 ± 25 14C yr BP (1737–1891 cal yr BP), respectively.

*Site 2, southwest of Arviat II*

At 149.5 m elevation, site 2 is within ~1 km of site 1, and is located at the base of a well defined beach ridge. Excavation of a 45 cm deep pit revealed alternating layers of light and dark brown peat to 35 cm depth underlain by dark brown, organic-rich, coarse sand. A light brown basal peat sample was obtained from 32 to 35 cm (10-51a), as well as an overlying dark brown peat sample from 21 to 23 cm (10-51b). A mixture of *Empetrum nigrum* seeds and *Carex* achenes was extracted from 10-51a, and moss fragments were extracted from 10-51b. Sample 10-51a yielded an age of 1430 ± 45 14C yr BP (1285–1401 cal yr BP), and sample 10-51b yielded an age of 1360 ± 15 14C yr BP (1278–1302 cal yr BP).

*Site 5, north of Carr Lake*

Site 5 is located at 104.5 m elevation, just north of Carr Lake. Excavation of a 22 cm pit exposed dark brown fibrous peat to 16–17 cm depth, in sharp contact with underlying brown medium-grained sand. *Empetrum nigrum* leaves and charred seeds extracted from a basal peat sample from 16 to 17 cm depth (10-48a) yielded an age of 1950 ± 20 14C yr BP (1830–1948 cal yr BP). An additional surficial sample was identified as marine algae. The algae appeared partially decomposed, and was matted within grass near the margin of a muddy surface depression. This sample (10-48c) yielded a radiocarbon age of −425 ± 20 14C yr BP, indicating that the sample is modern and post-dates mid-20th century thermonuclear bomb testing. The origin of the sample is unknown, but it is possible the sample is marine algae that was blown inland by strong winds.

*Site 6, north of Maguse Lake*

A 50 cm deep pit was excavated north of Maguse Lake at an elevation of 100 m. The pit exposed a layer of brown-black well humified peat intercalated with brown-grey medium-grained sand to a depth of 42 cm, which was underlain by orange-brown medium to coarse sand. A basal organic sample was collected from between 40.5 and 42.0 cm depth (10-46a). Beetle parts, including a worn *Carabidae* fossil head fragment and smaller parts of the ground beetle *Dyschiriodes* sp. were extracted from the sample, and yielded a radiocarbon age of 4155 ± 20 14C yr BP (4585–4824 cal yr BP). This sample represents the oldest terrestrial sample obtained from higher elevations as a part of this study.

*Site 7, southwest of Arviat III*

Site 7 is located approximately 85 km southwest of Arviat at an elevation of 81.5 m. Excavation of a 38 cm deep hole exposed layers of peat to 22 cm depth, grading to light brown medium to coarse sand beneath. A basal sample was obtained from 19 to 22 cm depth (10-52). Beetle parts of the genus *Notiophilus* were extracted from the sample, and yielded an age of 1855 ± 20 14C yr BP (1721–1865 cal yr BP).

*Site 10, west of Arviat I*

A 35 cm deep pit was excavated at a location approximately 40 km west of Arviat, at an elevation of 59.6 m. The pit exposed a layer of dark brown to black peat to 20 cm depth, in sharp contact with underlying medium-grained brown sand. A basal peat sample was collected from 18 to 20 cm depth (10-44). Parts of a predaceous diving beetle of the genus *Agabus* were extracted from the sample, and gave an age of 1380 ± 20 14C yr BP (1279–1331 cal yr BP).

*Site 11, south of Carr Lake*

A mixture of *Clinocardium ciliatum* and *Macoma* sp. shells were collected south of Carr Lake at an elevation of 59 m (GSC-1626, Lowdon and Blake, 1979). The shells yielded an age of 5780 ± 180 14C yr BP (6247–7086 cal yr BP).

*Site 12, active mudboils*

Site 12 is located within ~2 km of site 10, at 53 m elevation. The site location featured several elliptical mudboils approximately 1 m × 1.6 m across. Several shell fragments were found in one of the active mudboils within a matrix of grey pebbly mud. *Hiatella arctica* shell fragments were collected from the mudboil from the surface to 25 cm depth (10-42b). These shell fragments yielded an age of 5985 ± 15 14C yr BP (6735–6976 cal yr BP). This site was made known to us by one of the residents of Arviat.

*Site 13, Kaminak Lake II*

Detrital organic matter was retrieved from a sediment core collected from Kaminak Lake at 51 m elevation (GSC-2688, Blake, 1983). Radiocarbon dating of the organic material gave an age of 2370 ± 120 14C yr BP (2147-2742 cal yr BP).

*Site 14, west of Arviat II*

Site 14 is approximately 200 m from the active mudboils at site 12, and is at 50.8 m elevation. Excavation of a 52 cm deep hole exposed layers of peat to 43 cm in gradational contact with underlying organic-rich sandy mud. Fossil fragments of the ground beetle *Pterostichus* (*Cryobius*) *ventricosus* were extracted from a basal sample from 41 to 43 cm depth (10-43a), and yielded an age of 360 ± 15 14C yr BP (320–492 cal yr BP).

*Site 15, Maguse Road*

This site is located alongside Maguse Road, approximately 36 km northwest of Arviat at an elevation of 44.7 m. A 40 cm deep pit was dug, exposing a layer of thick fibrous peat in sharp contact with underlying grey muddy sand at 35 cm depth. The grey muddy sand was in turn in sharp contact with brown, pebbly, medium sand. A basal peat sample was obtained from 32 to 35 cm depth (10-53a). A mixture of *Carex* achenes, *Empetrum nigrum* seeds, and *Andromeda polifolia* (bog rosemary) seeds was extracted from this sample, and yielded an age of 2540 ± 40 14C yr BP (2488–2750 cal yr BP).

*Site 22, Arviat gully I*

This site is a gully that drained the former town reservoir in 1970, and is located on the outskirts of Arviat. Whole valves of *Hiatella arctica* were collected at the top of the gully at 8.9 m elevation (09-07a). These shells gave an age of 4420 ± 15 14C yr BP (4965–5263 cal yr BP).

*Site 23, Maguse Road gravel pit III*

Shell fragments were collected on the floor of a gravel pit at 6.5 m elevation. Radiocarbon dating one of these shell fragments (10-71) yielded an age of 4480 ± 15 14C yr BP (5039–5300 cal yr BP).

*Site 24, Maguse Road gravel pit IV*

Articulated valves of *Mya truncata* were collected in growth position (09-18a) from a gravel pit with abundant shells at 4.3 m elevation. The shells yielded an age of 3475 ± 15 14C yr BP (3700–3965 cal yr BP).

*Site 25, Arviat gully II*

Site 25 lies just south of site 22, and is located in the same gully that catastrophically drained the town reservoir in 1970 (W.W. Shilts in Lowdon and Blake, 1979). The sample (GSC-1427) is a *Mya truncata* shell with an age of 3000 ± 220 14C yr BP (2737–3808 cal yr BP) that was collected approximately 2 m above the high tide line, two days after the reservoir drained.